(see top half of page 17). On the other hand, the clamping device into which the molten metal is injected is oriented to open and close horizontally. To this end, the slurry discharged from the screw extruder is turned to the horizontal direction between the extruder and the clamping device. This is seen, e.g., in the figures wherein the flow channel 17 has a vertical channel 15 and a horizontal second channel 16, which are connected by a curved portion 17R (Figures. 1, 2 and 4). Alternatively, the vertical portion 15 can feed into the horizontal portion 16 (Figure 3). In all cases, a connection has a substantially vertical first channel, and a horizontal second channel.

Claims 1-4, 7, 17, 21, 22 and 24 stand rejected under 35 U.S.C. §103 as being obvious over the U.S. patent to Wang et al in view of the U.S. patent to Bradley et al. The Examiner there notes that Wang et al lacks a clamping device adapted to open and close in a horizontal direction, argues that it would have been obvious in view of Bradley et al. However, this is respectfully traversed.

Wang et al discloses an apparatus for molding semisolid materials such as metal alloys. It proposes using a vertically oriented screw extruder in order to produce porosity free metal parts. Thus, a vertically oriented screw 18 feeds material downward to a discharge valve 22 and a nozzle 6. There is no description or suggestion, whatsoever, of an injection molding apparatus having both a substantially vertically oriented screw extruder, and a clamping device adapted to open or close in a horizontal direction, together with a connection member having a first substantially vertical channel and a second channel extending horizontally from the lower end of the first channel and in communication with the clamping device, as is recited in Claim 1, or of a method including the discharged from the discharge port being turned in the horizontal direction and then injected into molding plates opening or closing in the horizontal direction (Claim 24).

Bradley et al discloses a horizontally oriented metal alloy injection system. The *entire* assembly in Bradley et al is oriented horizontally, i.e., both the screw 16 and the mold 22. There is no teaching or suggestion in this patent of combining the horizontal mold assembly with a vertically oriented screw assembly, particularly by incorporating the horizontal mold into the outlet of a vertical screw extruder.

The Examiner has proposed that it "would have been obvious to provide a clamping device in Wang et al in order to form and shape the final product as taught by Bradley et al." Applicants assume that the Examiner here intended to mean that it would have been obvious to provide a clamping device as in Bradley et al, in the extruder of Wang et al, since it is Bradley et al upon which the Examiner has relied for the teaching of a horizontal clamping device. Nonetheless, such a combination would clearly not have been obvious to those skilled in the art.

Wang et al is directed to a vertically oriented extruder. Bradley et al is directed to a horizontally oriented extruder. The Examiner has failed to put forth a motivation whereby those skilled in the art would have been motivated to have *selectively combined* these references by placing *only* the horizontally oriented mold 22 of Bradley et al in Wang et al. Since the extruder of Wang et al extends vertically and has a vertically oriented mold 35-36, those skilled in the art would not require Bradley et al to provide a mold, *per se*. And since Bradley et al discloses that both the screw extruder and the mold extend horizontally, why would those skilled in the art have been motivated thereby to modify only the orientation of the mold of Wang et al?

In any case, the claims recite an additional element which the Examiner has not purported to be presented in the prior art, i.e., a connection member having both a first channel substantially in a vertical direction, and a second channel extending horizontally

from a lower end of first channel and in communication with the stationary plate of the clamping device. (Claim 1), or the corresponding step of the material discharged from the discharge port being turned in the horizontal direction and then injected into molding plates opening or closing in the horizontal direction (Claim 24). No such connection member, or turning, is taught by Wang et al or Bradley et al, and neither reference provides a motivation for such "turning." The claims are therefore believed to clearly define over these references.

Claims 1-9, 17 and 21 were also rejected under 35 U.S.C. §103 as being obvious over the U.S. patent to Kono '372 in view of Wang et al and Bradley et al. The Examiner there recognized that Kono is not directed to an injection molding apparatus having a screw extruder. Instead, the Examiner proposed that it would have been obvious in view of Wang et al with a screw extruder, and it would have been obvious in view of Bradley et al to provide Kono, as modified by Wang et al, with the mold member 22 of Bradley et al. However, such a combination would be contrary to the teachings of Kono.

Kono discloses a horizontal injection molding device in which a molten material in an accumulation chamber 50 is extruded by the movement of the piston 45. The material is mixed by a mixer 32 and is fed to the chamber 50 by gravity (col. 3, line 45).

The Examiner has proposed that it would have been obvious to provide the screw extruder of Wang et al in Kono in order to break the growing dendrites of the solid phase into small and nearly spherical particles." Presumably the examiner means by this that it would have been obvious to replace the mixer 32 of Kono with the screw 18 of Wang et al.

Applicants respectfully submit that this would not have been obvious to those skilled in the art. The screw 18 of Wang et al shears the molten material between the screw flights and the barrel (col. 6, lines 25-42) and feeds the material to the accumulation zone 31. In contrast, the mixer 32 of Kono merely assures that the ratio of the solid and liquid is

consistent throughout the metal alloy (col. 3, lines 47 and 48). There is no shearing, and feeding is done by gravity. Thus, the mixer 32 does not have a shearing function. It also lacks a feeding function -- feeding is done by gravity (col. 3, line 45). Since the mixer 32 of Kono does not perform the functions of the screw of Wang et al, those skilled in the art would not have been motivated to replace the mixer 32 with a screw.

This is especially true since the vertical orientation of the barrel 30 of Kono is intended to provide the gravity feed (col. 3, lines 42-45); **it would be contrary to the teachings of Kono to modify the vertical barrel to use a feed screw since this would negate the purpose of its vertical orientation!** Therefore, whatever teaching Bradley et al might provide with regard to a mold, the combination of Kono, Wang et al and Bradley in the manner set forth in paragraph 4 of the Office Action would not have been obvious to those skilled in the art.

Claims 10-15 further recite the static mixer, e.g., 51, disposed in the nozzle for mixing the slurry passing through the nozzle. Rock was additionally cited to disclose a static mixture in the combination of Kono, Wang et al and Bradley et al (paragraph 5). However, Rock merely discloses a mixer used for making metal foam from liquid alloys 5 and 13, which are fed by gravity. There is no suggestion in Rock that that mixing provided for gravity fed materials would also be applicable to the discharge of an injection molding apparatus. For this reason, and because of the lack of obviousness for those skilled in the art to combine Kono with Wang et al, as set forth above, Applicants respectfully submit that Claims 10-15 define over any combination of the above references.

Regarding paragraph 6 of the Office Action, regardless of what details Mercer et al might have with respect to the teachings of the dependent claims, it provides no teaching for overcoming the shortcomings of Kono, Wang et al, Bradley et al as set forth above, and so

Claim 1 and its dependent Claims 18-20 and 23 are believed to clearly define over any combination of the above references.

Regarding the rejection under 35 U.S.C. §112, Claim 24 has been amended to recite active steps. Concerning Claim 8, Applicants respectfully submit that those skill in the art would recognize, without further description, that a compression ratio of 1.0 means that the material is not compressed by its passage through the screw segments.

Applicants therefore believe that the present application is in a condition for allowance and respectfully solicit an early notice of allowability.

Respectfully submitted,

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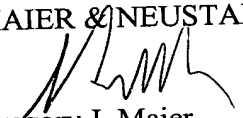

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IN THE SPECIFICATION

Page 17, paragraph beginning at line 3 through line 8, delete in its entirety and insert therefor the following new paragraph.

--That is, in the method of the present invention, since the molten metal 5 is formed into the semi-solidified slurry 7 in the vertical chamber 2, the molten metal 5 is formed into the slurry 7 after the insert gas [the molten metal is formed into the slurry 7 after the inert gas] contained in the molten metal 5 has been driven off by the pressure and the buoyancy. Accordingly, mixing of pores into the molding products due to involvement of the inert gas can be prevented, thereby preventing occurrence of defective products as less as possible.--

IN THE CLAIMS

--24. (Amended) A method of injection molding a light metal alloy [in which] comprising the steps of:

cooling a molten metal [is cooled] under shearing by an extrusion screw into a semi-solidified slurry in a substantially vertical chamber [and subsequently,];

discharging the semisolidified slurry [discharged] from a discharge port at the lower end of the chamber;

turning the semi-solidified slurry [is once turned] in the horizontal direction; and [then injected]

injecting the turned semi-solidified slurry into molding plates opening or closing in the horizontal direction.--